120.900: RADIATION SAFETY REQUIREMENTS FOR WIRELINE SERVICE OPERATIONS AND SUBSURFACE TRACER STUDIES

120.901: Purpose and Scope

(A) 105 CMR 120.900 prescribes requirements for the issuance of a license or certificate of registration authorizing the use of sources of radiation for well logging in a single well. 105 CMR 120.900 also establishes radiation safety requirements for persons using sources of radiation for wireline service operations including mineral logging, radioactive markers, and subsurface tracer studies. The requirements of 105 CMR 120.900 are in addition to, and not in substitution for, the requirements of 105 CMR 120.001, 120.020, 120.750, 120.100 and 120.200.

(B) 105 CMR 120.900 applies to all licensees or registrants who use sources of radiation for wireline service operations including mineral logging, radioactive markers, uranium sinker bars, or subsurface tracer studies. 105 CMR 120.900 does not apply to the use of radioactive material in tracer studies involving multiple wells, such as field flood studies, or to the use of sealed sources auxiliary to well-logging but not lowered into wells.

120.902: Definitions

As used in 105 CMR 120.900, the following definitions apply:

Energy Compensated Source (ECS) means a small sealed source with an activity not exceeding 3.7 megabecquerel (100 μCi), used within a logging tool or other tool components, to provide a reference standard to maintain the tool's calibration when in use.

Field Station means a facility where radioactive sources may be stored or used and from which equipment is dispatched to temporary jobsites.

Fresh Water Aquifer for the purpose of this part, means a geologic formation that is capable of yielding fresh water to a well or spring.

Injection Tool means a device used for controlled subsurface injection of radioactive tracer material.

Irretrievable Well-logging Source means any sealed source containing radioactive material that is pulled off or not connected to the wireline that suspends the source in the well and for which all reasonable effort at recovery has been expended.

Logging Assistant means the individual who, under the personal supervision of a logging supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers or who performs surveys required by 105 CMR 120.951.

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Logging Supervisor means the individual who uses licensed material or provides personal supervision of the utilization of sources of radiation at a temporary jobsite and who is responsible to the licensee or registrant for assuring compliance with the requirements of the Agency's regulations and the conditions of the license or registration.

Logging Tool means a device used subsurface to perform well-logging.

Mineral Logging means any logging performed for the purpose of mineral exploration other than oil or gas.

Personal Supervision means guidance and instruction by the logging supervisor who is physically present at a temporary jobsite and watching the performance of the operation in such proximity that contact can be maintained and immediate assistance given as required.

Personnel Monitoring Badge means an individual personnel dosimeter that is processed and evaluated by accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor.

Radioactive Marker means radioactive material placed subsurface or on a structure intended for subsurface use for the purpose of depth determination or direction orientation.

Safety Review means a periodic review provided by the licensee for its employees on radiation safety aspects of well logging. The review may include, as appropriate, the result of internal inspections, new procedures or equipment, accidents or errors that have been observed, and opportunities for employees to ask safety questions.

Source Holder means a housing or assembly into which a radioactive source is placed for the purpose of facilitating the handling and use of the source in well-logging operations.

Subsurface Tracer Study means the release of unsealed radioactive material or a substance tagged with radioactive material for the purpose of tracing the movement or position of the radioactive material or tagged substance in the well-bore or adjacent formation.

Surface Casing for Protecting Fresh Water Aquifers means a pipe or tube used as a lining in a well to isolate fresh water aquifers from the well.

Temporary Jobsite means a location to which radioactive materials have been dispatched to perform wireline service operations or subsurface tracer studies.

Tritium Neutron Generator Target Source means a tritium source used within a neutron generator tube to produce neutrons for use in well-logging applications.

Uranium Sinker Bar means a weight containing depleted uranium used to pull a logging tool toward the bottom of well.

Well-bore means a drilled hole in which wireline service operations and subsurface tracer studies are performed.

Well-logging means the lowering and raising of measuring devices or tools which may contain sources of radiation into well-bores or cavities for the purpose of obtaining information about the well and/or adjacent formations.

Wireline means a cable containing one or more electrical conductors which is used to lower and raise logging tools in the well-bore.

Wireline Service Operation means any evaluation or mechanical service which is performed in the well-bore using devices on a wireline.

120.903: Licensing and Registration Requirements for Wireline Service Operations

The Agency will approve an application for a specific license for the use of licensed material or a registration for use of radiation machines if the applicant meets the following requirements:

(A) The applicant satisfies the general requirements specified in 105 CMR 120.020 for radiation machine facilities or 105 CMR 120.100 for radioactive material, as applicable, and any special requirements contained in 105 CMR 120.900;

(B) The applicant submits an adequate program for training logging supervisors and logging assistants that includes:

(1) Initial training;
(2) On-the-job training;
(3) Annual safety revies provided by the licensee;
(4) Means the applicant will use to demonstrate the logging supervisor's knowledge and understanding of and ability to comply with 105 CMR 120.900 and licensing requirements and the applicant's operating and emergency procedures; and
(5) Means the applicant will use to demonstrate the logging assistant's knowledge and understanding of and ability to comply with the applicant's operating and emergency procedures.

(C) The applicant shall submit to the Agency written operating and emergency procedures as described in 105 CMR 120.932 or an outline or summary of the procedures that includes the important radiation safety aspects of the procedures.

(D) The applicant shall establish and submit to the Agency its program for annual inspections of the job performance of each logging supervisor to ensure that 105 CMR 120.000, license or registration requirements, and the applicant's operating and emergency procedures are followed. Inspection records must be retained for three years after each annual internal inspection.

(E) The applicant submits a description of the applicant's overall organizational structure as it applies to the radiation safety responsibilities in industrial radiography, including specified delegation of authority and responsibility;

(F) If an applicant intends to perform leak testing of sealed sources, the applicant shall identify the manufacturers and model numbers of the leak test kits to be used. If the applicant wants to analyze its own wipe samples, the applicant shall establish procedures to be followed and submit a description of these to the Agency. The description must include the:

(1) Instruments to be used;
(2) Methods of analyzing the samples; and
(3) Pertinent experience of the person who will analyze the wipe samples.

120.904: Agreement with Well Owner or Operator

No licensee shall perform wireline service operations with a sealed source(s) unless, prior to commencement of the operation, the licensee has a written agreement with the well operator, well owner, drilling contractor, or land owner. The licensee shall retain a copy of the written agreement for three years after the well logging operation has been completed. The written agreement shall identify who will meet the following requirements:

(A) (1) In the event a sealed source is lodged downhole, a reasonable effort at recovery will be made.
(2) A person may not attempt to recover a sealed source in a manner which, in the licensee's opinion, could result in its rupture.
(3) The licensee shall conduct radiation monitoring to detect any contamination.
(a) If the licensee detects evidence of that a sealed source has ruptured or licensed materials have caused contamination, the licensee shall initiate immediately the emergency procedures required in 105 CMR 120.932.
(b) If contamination results from the use of licensed material in well logging, the licensee shall decontaminate all work areas, equipment, and unrestricted areas.

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(c) During efforts to recover a sealed source lodged in the well, the licensee shall continuously monitor, with an appropriate radiation detection instrument or a logging tool with a radiation detector, the circulating fluid from the well, if any, to check for contamination resulting from damage to the sealed source.

(4) If the environment, any equipment, or personnel are contaminated with licensed material, they must be decontaminated before release from the site or release for unrestricted use.

(5) If the sealed source is classified as irretrievable after reasonable efforts at recovery have been expended, the following requirements must be implemented within 30 days:

(a) Each irretrievable well logging source must be immobilized and sealed in place with a cement plug.

(b) A means to prevent inadvertent intrusion on the source, unless the source is not accessible to any subsequent drilling operations; and,

(c) A permanent identification plaque, constructed of long lasting material such as stainless steel, brass, bronze, or monel, must be mounted at the surface of the well, unless the mounting of the plaque is not practical. The size of the plaque must be at least 17 cm (seven inches) square and three mm (⅛") thick. The plaque must contain:

1. The word "CAUTION";
2. The radiation symbol (the conventional color requirement need not be met);
3. The date of abandonment;
4. The name of the well operator or well owner;
5. The well name and well identification number(s) or other designation;
6. The sealed source(s) by radionuclide and quantity of activity;
7. The source depth and the depth to the top of the plug; and,
8. An appropriate warning, depending on the specific circumstances of each abandonment. (Appropriate warnings may include: (A) "Do not drill below plug back depth"; (B) "Do not enlarge casing"; or (C) "Do not re-enter the hole", followed by the words, "before contacting the Massachusetts Radiation Control Program".)

(B) In the event a decision is made to abandon the sealed source downhole, the requirements of 105 CMR 120.904(A) and any other Commonwealth Agency having applicable regulations shall be met.

(C) The licensee shall retain a copy of the written agreement for three years after the completion of the well logging operation.

(D) A licensee may apply, pursuant to 105 CMR 120.904, for Agency approval, on a case-by-case basis, of proposed procedures to abandon an irretrievable well logging source in a nanner not otherwise authorized in 105 CMR 120.904(A)(5).

EQUIPMENT CONTROL

120.911: Labels, Security, and Transport Requirements

(A) Labels.

(1) The licensee may not use a source, source holder, or logging tool that contains licensed material unless the smallest component that is transported as a separate piece of equipment with the licensed material inside bears a durable, legible, and clearly visible marking or label. The marking or label must contain the radiation symbol specified in 105 CMR 120.237(A) without the conventional color requirements, and the wording "DANGER (or CAUTION) RADIOACTIVE MATERIAL."

(2) The licensee may not use a container to store licensed material unless the container has securely attached to it a durable, legible, and clearly visible label. The label must contain the radiation symbol specified in 105 CMR 120.237(A) and the wording "CAUTION (or DANGER), RADIOACTIVE MATERIAL, NOTIFY CIVIL AUTHORITIES (or NAME OF COMPANY)."

(3) The licensee may not transport licensed material unless the material is packaged, labeled, marked, and accompanied with appropriate shipping papers in accordance with 105 CMR 120.775.

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(B) Security Precautions during Storage and Transportation.

(1) The licensee shall store each source containing licensed material in a storage container or transportation package. The container or package must be locked and physically secured to prevent tampering or removal of licensed or registered material from storage by unauthorized personnel. The licensee shall store licensed or registered material in a manner which will minimize danger from explosion or fire.

(2) The licensee shall lock and physically secure the transport package containing licensed or registered material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed or registered material from the vehicle.

120.914: Radiation Survey Instruments

(A) The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments capable of detecting beta and gamma radiation at each field station and temporary jobsite to make physical radiation surveys as required by 105 CMR 120.900 and 120.221. Instrumentation shall be capable of measuring 0.1 milliroentgen (2.58×10^{-8} C/kg) per hour through at least 50 milliroentgens (1.29×10^{-5} C/kg) per hour.

(B) Each radiation survey instrument shall be calibrated:

(1) At intervals not to exceed six months and after each instrument servicing;

(2) For linear scale instruments, at two points located approximately and of full-scale on each scale; for logarithmic scale instruments, at mid-range of each decade, and at two points of at least one decade; and for digital instruments, at appropriate points; and,

(3) So that accuracy within plus or minus 20% of the true radiation level can be demonstrated on each scale.

(C) Calibration records shall be maintained for a period of three years for inspection by the Agency.

(D) The licensee shall have available additional calibrated and operable radiation detection instruments sensitive enough to detect the low radiation and contamination levels that could be encountered if a sealed source ruptured. The licensee may own the instruments or may have a procedure to obtain them in a timely manner from a second party.

120.915: Leak Testing of Sealed Sources

(A) Requirements. Each licensee using sealed sources of radioactive material shall have the sources tested for leakage. Records of leak test results shall be kept in units of becquerel (mμCi)and maintained for inspection by the Agency for three years after the leak test is performed.

(B) Method of Testing. Tests for leakage shall be performed only by persons specifically authorized to perform such tests by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State. The wipe sample shall be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample shall be analyzed for radioactive contamination, and the analysis shall be capable of detecting the presence of (185 becquerel) (0.005 μCi) of radioactive material on the wipe sample.

(C) Interval of Testing. Each sealed source of radioactive material shall be tested at intervals not to exceed six months. Each ECS that is not exempt from testing in accordance with 105 CMR 120.915(A). shall be tested at intervals not to exceed three years. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source shall not be put into use until tested. If it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage as soon as practical.

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(D) Leaking or Contaminated Sources. If the test reveals the presence of 0.005 microcurie (185 Bq) or more of leakage or contamination, the licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired, or disposed of in accordance with 105 CMR 120.200. The licensee shall check the equipment associated with the leaking or contaminated source for radiation contamination and, if contaminated, have it decontaminated or disposed of by an NRC or Agreement State licensee. A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the Agency within five working days.

(E) Exemptions. The following sources are exempted from the periodic leak test requirements of 105 CMR 120.915(A) through (D):

(1) Hydrogen-3 sources;
(2) Sources of radioactive material with a half-life of 30 days or less;
(3) Sealed sources of radioactive material in gaseous form;
(4) Sources of beta- and/or gamma-emitting radioactive material with an activity of 3.7 megabecquerel) (100 μCi)) or less; and
(5) Sources of alpha-emitting radioactive material with an activity of 0.370 MB (10 μCi) or less.

120.916: Physical Inventory

Each licensee or registrant shall conduct a semi-annual physical inventory to account for all sources of radiation. Records of inventories shall be maintained for three years from the date of the inventory for inspection by the Agency and shall include the quantities and kinds of sources of radiation, the location where sources of radiation are assigned, the date of the inventory, and the name of the individual conducting the inventory. Physical inventory records may be combined with leak test records.

120.917: Utilization Records

Each licensee or registrant shall maintain current records, which shall be kept available for inspection by the Agency for three years from the date of the recorded event, showing the following information for each source of radiation:

(A) Make, model number, and a serial number or a description of each source of radiation used;

(B) The identity of the well-logging supervisor or field unit to whom assigned and the identity of the logging assistants present;

(C) Locations where used and dates of use; and,

(D) In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well and the disposition of any unused tracer materials.

120.918: Design, Performance, and Certification Criteria for Sealed Sources Used in Downhole Operations

(A) A licensee may use a sealed source for well logging applications if:

(1) The sealed source is doubly encapsulated;
(2) The sealed source contains licensed radioactive material whose chemical and physical forms are as insoluble and non-dispersible as practical; and
(3) Meets the requirement of 105 CMR 120.918(B), (C),or (D).

(B) For a sealed source manufactured on or before July 14, 1989, a licensee may use the sealed source for well logging applications, if it meets the requirements of USAI N5.10-1968, "Classification of Sealed Radioactive Sources," or the requirements of 105 CMR 120.918(C) or (D).

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(C) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source for well logging applications, if it meets the oil-well logging requirements of ANSI/HPS N.43.6-1997, "Sealed Radioactive Sources-Classifications."

(D) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source for well logging applications, if:

(1) The sealed source's prototype has been tested and found to maintain its integrity after each of the following tests:

(a) Temperature. The test source must be held at -40EC for 20 minutes, 600EC for one hour and then be subject to a thermal shock test with a temperature drop from 600EC to 20 C within 15 seconds.

(b) Impact Test. A five kg steel hammer, 2.5 cm in diameter, must be dropped from a height of 1 m onto the test source.

(c) Vibration Test. The test source must be subjected to a vibration from 25 Hz to 500 Hz at five g amplitude for 30 minutes.

(d) Puncture Test. A one gram hammer and pin, 0.3 cm pin diameter, must be dropped from a height of 1 m onto the test source.

(e) Pressure Test. The test source must be subject to an external pressure of 1.695 x 10^7 pascals (24,600 pounds per square inch absolute).

(E) The requirements of 105 CMR 120.918(A), (B), (C), and (D) do not apply to sealed sources that contain radioactive material in gaseous form.

(F) The requirements in 105 CMR 120.918(A) through 105 CMR 120.918(D) do not apply to energy compensated sources (ECS). ECSs must be registered with the Agency under 105 CMR 120.128(N) or with the U.S. Nuclear Regulatory Commission under 10 CFR 32.210 or with an Agreement State.

120.920: Inspection, Maintenance and Opening of a Source or Source Holder

(A) Each licensee shall visually check source holders, logging tools, and source handling tools, for defects before each use to ensure that the equipment is in good working condition and that required labeling is present. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing: the equipment involved, defects found, and retained for three years after the defect is found.

(B) Each licensee or registrant shall have a program for semi-annual visual inspection and routine maintenance of source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uraniun sinker bars to ensure that the required labeling is legible and that no physical damage is visible. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing: date, equipment involved, inspection and maintenance operations performed, any defects found, and any actions taken to correct the defects. Records of inspection and maintenance shall be maintained for a period of three years for inspection by the Agency.

(C) Removal of a sealed source from a source holder or logging tool, and maintenance on sealed sources or holders in which sealed sources are contained may not be performed by the licensee unless a written procedure developed pursuant to 105 CMR 120.932 has been approved either by the Agency pursuant to 105 CMR 120.903(C), the NRC, an Agreement State or a Licensing State.

(D) If a sealed source is struck in the source holder, the licensee shall not perform any operation, such as drilling, cutting, or chiselling, on the source holder unless the licensee is specifically approved by the Agency to perform such operation.

(E) The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State.

120.922: Handling Tools

The licensee shall provide and require the use of tools that will assure remote handling of sealed sources other than low activity calibration sources.

120.923: Subsurface Tracer Studies

(A) The licensee shall require all personnel handling radioactive tracer material to use protective gloves and, if required by the license, other appropriate protective clothing and equipment. The licensee shall take precautions to avoid ingestion or inhalation of radioactive tracer material and to avoid contamination of the field stations and temporary jobsites.

(B) A licensee may not knowingly inject radioactive material into fresh water aquifers without prior written authorization from the Agency.

120.924: Radioactive Markers

The licensee may use radioactive markers in wells only if the individual markers contain quantities of radioactive material not exceeding the quantities specified in 105 CMR 120.196: *Appendix B Table I.* The use of radioactive markers is subject to the requirements of 105 CMR 120.916.

120.925: Uranium Sinker Bars

The licensee may use a uranium sinker bar in well logging after the effective date of 105 CMR 120.000 only if it is legibly impressed with the words "CAUTION -- RADIOACTIVE -- DEPLETED URANIUM" and "NOTIFY CIVIL AUTHORITIES (or COMPANY NAME) IF FOUND."

120.926: Use of a Sealed Source in a Well Without a Surface Casing

The license may use a sealed source in a well without casing for protecting fresh water aquifers only if the licensee follows a procedure for reducing the probability of the source becoming lodged in the well. The procedure must be approved by the Agency pursuant to 105 CMR 120.903(C).

120.927: Energy Compensated Sources

The licensee may use an energy compensated source (ECS) which is contained within a logging tool, or other tool components, only if the ECS contains quantities of radioactive material not exceeding 3.7 megabecquerel. (100 μCi).

(A) For well-logging applications with a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 105 CMR 120.915, 120.916 and 120.917.

(B) For well-logging applications without a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of 105 CMR 120.904, 120.915, 120.916, 120.917, 120.926 and 120.954.

120.928: Tritium Neutron Generator Target Source

Use of a tritium neutron generator target source, containing quantities not exceeding 1.110 terabecquerels (30 Ci) and in a well with a surface casing to protect fresh water aquifers, is subject to the requirements of 105 CMR 120.900 except 105 CMR 120.904, 120.918 and 120.954.

(B) Use of a tritium neutron generator target source containing quantities exceeding 1.110 terabecquerels (30 Ci) or in a well without a surface casing to protect fresh water aquifers, is subject to the requirements of 105 CMR 120.900 except 120.918.

120.929: Particle Accelerators

No licensee or registrant shall permit above-ground testing of particle accelerators, designed for use in well logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the requirements of 105 CMR 120.200, as applicable, are met.

RADIATION SAFETY REQUIREMENTS

120.931: Training Requirements

(A) The licensee or registrant may not permit any individual to act as a logging supervisor as defined in 105 CMR 120.900 until such individual has:

(1) Successfully completed a course recognized by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State, at least 24 hours of formal training in the subjects outlined in 105 CMR 20.960: *Appendix A*;

(2) Received copies of and instruction in the regulations contained in 105 CMR 120.900 and the applicable sections of 105 CMR 120.001, 120.200 and 120.750 or their equivalent, conditions of appropriate license or certificate of registration, and the licensee's or registrant's operating and emergency procedures;

(3) Demonstrated understanding of the requirements of 105 CMR 120.931(A)(1) and 120.931(A)(2) by successfully completing a written examination administered by the licensee or registrant;

(4) Completed 320 hours of on-the-job training under the supervision of a logging supervisor; and

(5) Demonstrated through a field evaluation, competence to use sources of radiation, related handling tools, and survey instruments which will be used on the job.

(B) The licensee or registrant may not permit any individual to act as a logging assistant until such individual has:

(1) Received copies of and instruction in the regulations contained in 105 CMR 120.900 and in the applicable sections of 105 CMR 120.001, 120.200 and 120.750 and the licensee's or registrant's operating and emergency procedures and demonstrated an understanding thereof;

(2) Demonstrated competence to use, under the personal supervision of the logging supervisor, the sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.

(C) The licensee or registrant shall provide safety review for logging supervisors and logging assistants at least once during each calendar year.

(D) The licensee or registrant shall maintain records documenting the training and reviews required by 105 CMR 120.931(A), (B) and (C) for inspection by the Agency for three years following termination of employment.

120.932: Operating and Emergency Procedures

The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

(A) Handling and use of sources of radiation, including the use of sealed sources in wells without surface casing for protecting fresh water aquifers if appropriate;

(B) Methods and occasions for conducting radiation surveys, including surveys for detecting contamination;

(C) Methods and occasions for locking and securing sources of radiation;

(D) Personnel monitoring and the use of personnel monitoring equipment;

(E) Transportation to temporary jobsites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding of vehicles, and securing sources of radiation during transportation to prevent accidental loss, tampering or unauthorized removal;

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(F) Minimizing exposure of individuals in the event of an accident;

(G) Procedure for notifying proper personnel in the event of an accident;

(H) Maintenance of records, including records generated by logging personnel at temporary jobsites;

(I) Inspection and maintenance of sealed sources, source holders, logging tools, source handling tools, storage containers, transport containers, injection tools and uranium sinker bars;

(J) Procedure to be followed in the event a sealed source is lodged downhole;

(K) Procedures to be used for picking up, receiving, and opening packages containing radioactive material;

(L) For the use of tracers, decontamination of the environment, equipment, and personnel;

(M) Actions to be taken if a sealed source is ruptured, including actions to prevent the spread of contamination and minimize inhalation and ingestion of radioactive material and actions to obtain suitable radiation survey instruments as required by 105 CMR 120.914(B);

(O) The use of remote handling tools for handling sealed sources and radioactive tracer material except low-activity calibration sources; and

(P) Identifying and reporting to the Agency defects and noncompliance as required by 10 CFR Part 21 of the NRC regulations

120.933: Personnel Monitoring

(A) The licensee or registrant may not permit any individual to act as a logging supervisor or to assist in the handling of sources of radiation unless each such individual wears, at all times during the handling of licensed radioactive material and sources of radiation, a personnel dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor. Each personnel monitoring badge shall be assigned to and worn by only one individual. Film badges shall be replaced at least monthly and other personnel monitoring badges replaced at least quarterly. After replacement, each personnel dosimeter must be promptly processed. If a personnel monitoring badge is lost or damaged, the worker shall cease work immediately until a replacement badge is provided and the exposure is calculated by the RSO or the RSO's designee for the time period from issuance to loss or damage of the badge. The results of the calculated exposure and the time period for which the personnel monitoring badge was lost or damaged shall be provided to the processor to adjust the individual's occupational exposure record.

(B) The licensee shall provide bioassay services to individuals using radioactive materials in tracer studies if required by the license.

(C) Personnel monitoring records shall be maintained for inspection until the Agency authorizes disposition.

120.941: Radiation Surveys

(A) Radiation surveys shall be made and recorded for each area where radioactive materials are stored.

(B) Before transporting licensed material, radiation surveys and/or calculations shall be made and recorded for the radiation levels in positions occupied by each individual in the vehicle and on the exterior of each vehicle used to transport the licensed radioactive material. Such surveys and/or calculations shall include each source of radiation or combination of sources to be transported in the vehicle.

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(C) If the sealed source is removed from the logging tool before the departure from the temporary jobsite, the logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is free of contamination.

(D) If the licensee has reason to believe that, as a result of any operation involving a sealed source, the encapsulation of the sealed source could be damaged by the operation, the licensee shall conduct a radiation survey, including a contamination survey, during and after the operation.

(F) Records required pursuant to 105 CMR 120.951(A) through (E) shall include the dates, the identification of individual(s) making the survey, the identification of survey instrument(s) used, and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the Agency for three years after completion of the survey.

120.951: Security

(A) A logging supervisor must be physically present at a temporary jobsite whenever licensed material are being handled or are not stored and locked in a vehicle or storage place. The logging supervisor may leave the jobsite in order to obtain assistance if a source becomes lodged in the well.

(B) During each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized and/or unnecessary entry into a restricted area, as defined in 105 CMR 120.005.

120.952: Documents and Records Required at Field Stations

Each licensee or registrant shall maintain, for inspection by the Agency, the following documents and records for the specific devices and sources used at the field station:

(A) Appropriate license, certificate of registration, or equivalent document;

(B) Operating and emergency procedures;

(C) Applicable regulations;

(D) Records of the latest survey instrument calibrations pursuant to 105 CMR 120.914;

(E) Records of the latest leak test results pursuant to 105 CMR 120.915;

(F) Quarterly inventories required pursuant to 105 CMR 120.916;

(G) Utilization records required pursuant to 105 CMR 120.917;

(H) Records of inspection and maintenance required pursuant to 105 CMR 120.920;

(I) Survey records required pursuant to 105 CMR 120.951; and,

(J) Training records required pursuant to 105 CMR 120.931.

120.953: Documents and Records Required at Temporary Jobsites

Each licensee or registrant conducting operations at a temporary jobsite shall have the following documents and records available at that site for inspection by the Agency:

(A) Operating and emergency procedures;

(B) Survey records required pursuant to 105 CMR 120.951 for the period of operation at the site;

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(C) Evidence of current calibration for the radiation survey instruments in use at the site;

(D) When operating in the Commonwealth under reciprocity, a copy of the appropriate license, certificate of registration, or equivalent document(s); and,

(E) Shipping papers for transportation of radioactive material.

120.954: Notification of Incidents, Abandonment, and Lost Sources

(A) Notification of incidents and sources lost in other than downhole logging operations shall be made in accordance with provisions of 105 CMR 120.281 and 120.282 and 120.142.

(B) Whenever a sealed source or device containing radioactive material is lodged downhole, the licensee shall:

(1) Monitor at the surface for the presence of radioactive contamination with a radiation survey instrument or logging tool during logging tool recovery operations; and,

(2) Notify the Agency immediately by telephone and subsequently, within 30 days, by confirmatory letter if the licensee knows or has reason to believe that a sealed source has been ruptured. This letter shall identify the well or other location, describe the magnitude and extent of the escape of radioactive material, assess the consequences of the rupture, and explain efforts planned or being taken to mitigate these consequences.

(C) When it becomes apparent that efforts to recover the radioactive source will not be successful, the licensee shall:

(1) Advise the well-operator of an appropriate method of abandonment, which shall include:

(a) The immobilization and sealing in place of the radioactive source with a cement plug;

(b) The setting of a whipstock or other deflection device; and,

(c) The mounting of a permanent identification plaque, at the surface of the well, containing the appropriate information required by 105 CMR 120.954(D);

(2) Notify the Agency by telephone, giving the circumstances of the loss, and request approval of the proposed abandonment procedures; and

(3) File a written report with the Agency within 30 days of the abandonment, setting forth the following information:

(a) Date of occurrence and a brief description of attempts to recover the source;

(b) A description of the radioactive source involved, including radionuclide, quantity, and chemical and physical form;

(c) Surface location and identification of well;

(d) Results of efforts to immobilize and set the source in place;

(e) Depth of the radioactive source;

(f) Depth of the top of the cement plug;

(g) Depth of the well; and,

(h) Information contained on the permanent identification plaque.

(D) Whenever a sealed source containing radioactive material is abandoned downhole, the licensee shall provide a permanent plaque for posting the well or well-bore (an example of a suggested plaque is shown in 105 CMR 120.900: *Appendix* 120.770(B). This plaque shall:

(1) Be constructed of long-lasting material, such as stainless steel or monel; and,

(2) Contain the following information engraved on its face:

(a) The word "CAUTION";

(b) The radiation symbol without the conventional color requirement;

(c) The date of abandonment;

(d) The name of the well operator or well owner;

(e) The well name and well identification number(s) or other designation;

(f) The sealed source(s) by radionuclide and quantity of activity;

(g) The source depth and the depth to the top of the plug; and,

(h) An appropriate warning, depending on the specific circumstances of each abandonment. (Appropriate warnings may include: (A) "Do not drill below plug back depth"; (B) "Do not enlarge casing"; or (C) "Do not re-enter the hole", followed by the words, "before contacting the Massachusetts Radiation Control Program".)

120.954: continued

(E) The licensee shall immediately notify the Agency by telephone and subsequently by confirming letter if the licensee knows or has reason to believe that radioactive material has been lost in or to an underground potable aquifer. Such notice shall designate the well location, describe the magnitude and extent of loss of radioactive material, the consequences of such loss, and explain efforts planned or being taken to mitigate these consequences.

120.960: Appendix A -- Subjects to be Included in Training Courses for Logging Supervisors

I. Fundamentals of Radiation Safety.
- A. Characteristics of radiation
- B. Units of radiation dose and quantity of radioactivity
- C. Significance of radiation dose
  1. Radiation protection standards
  2. Biological effects of radiation dose
- D. Levels of radiation from sources of radiation
- E. Methods of minimizing radiation dose
  1. Working time
  2. Working distances
  3. Shielding
- F. Radiation safety practices including prevention of contamination and methods of decontamination.

II. Radiation Detection Instrumentation to be Used.
- A. Use of radiation survey instruments
  1. Operation
  2. Calibration
  3. Limitations
- B. Survey techniques
- C. Use of personnel monitoring equipment

III. Equipment to be Used.
- A. Handling equipment
- B. Sources of radiation
- C. Storage and control of equipment
- D. Operation and control of equipment

IV. The Requirements of Pertinent Federal and Commonwealth Regulations

V. The Licensee's or Registrant's Written Operating and Emergency Procedures

VI. The Licensee's or Registrant's Record Keeping Procedures

120.961: Appendix B -- Example of Plaque for Identifying Wells Containing Sealed Sources Containing Radioactive Material Abandoned Downhole

The size of the plaque should be convenient for use on active or inactive wells, *e.g.*, a seven-inch square. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information, *e.g.*, ½-inch and ¼-inch letter size, respectively.

REGULATORY AUTHORITY

105 CMR 120.000: M.G.L. c. 111, §§ 3, 5, 5M, 5N, 5O and 5P.

NON-TEXT PAGE